Claims

1. A nucleic acid molecule encoding non-glycosylated human alpha-fetoprotein (ng.HuAFP), or a nonglycosylated fragment thereof.

2. The nucleic acid molecule of claim 1, comprising nucleotides 45 through 1874 of the sequence set forth in SEQ ID NO: 5.

3. A nucleic acid molecule comprising: (i) a nucleic acid sequence encoding ng.HuAFP, (ii) a promoter that is operably linked to said ng.HuAFP-encoding sequence that enables expression of ng.HuAFP, and (iii) a leader sequence encoding a protein secretory signal that enables secretion of said ng.HuAFP by a cell.

4. The nucleic acid molecule of claim 3, wherein said cell is an *E. coli*.

5. The nucleic acid molecule of claim 3, wherein said cell is a eukaryotic cell.

6. The nucleic acid molecule of claim 5, wherein said eukaryotic cell is a yeast cell or an animal cell.

7. The nucleic acid molecule of claim 6, wherein said animal cell is in a transgenic animal.

8. The nucleic acid molecule of claim 7, wherein said transgenic animal is a mammal.

9. The nucleic acid molecule of claim 8, wherein said mammal is a goat, sheep, camel, cow, pig, rabbit, horse, or llama.

10. The nucleic acid molecule of claim 3, wherein said cell is a biological fluid-producing cell in a transgenic animal; said promoter enables expression of said ng.HuAFP in said biological fluid-producing cell; and said leader sequence enables secretion of said ng.HuAFP into a biological fluid of said transgenic animal.

11. The nucleic acid molecule of claim 10, wherein said biological fluid is milk, urine, blood, or lymph.

12. The nucleic acid molecule of claim 3, wherein: said cell is in a transgenic animal; said promoter is a milk-specific promoter that enables expression of said ng.HuAFP in a milk-producing cell of said animal; and said leader sequence enables secretion of said ng.HuAFP into the milk of said animal.

13. The nucleic acid molecule of claim 3, wherein: said cell is in a transgenic animal; said promoter is a urine-specific promoter that enables expression of said

ng.HuAFP in a urine-producing cell of said animal; and said leader sequence enables secretion of said ng.HuAFP into the urine of said animal.

14. The nucleic acid molecule of claim 3, wherein: said cell is in a transgenic animal; said promoter is a blood-specific promoter that enables expression of said ng.HuAFP in a blood-producing cell of said animal; and said leader sequence enables secretion of said ng.HuAFP into the blood of said animal.

15. The nucleic acid molecule of claim 3, wherein said cell is in a transgenic animal; said promoter is a lymph-specific promoter that enables expression of said ng.HuAFP in a lymph-producing cell of said animal; and said leader sequence enables secretion of said ng.HuAFP into the lymph of said animal.

16. Non-glycosylated HuAFP (ng.HuAFP) comprising a glutamine residue at position 233 of SEQ ID NO: 4.

17. A polypeptide comprising the amino acid sequence set forth in SEQ ID NO: 6.

18. A substantially pure biologically-active fragment of non-glycosylated human alpha-fetoprotein.

19. The polypeptide of claim 18, wherein said fragment comprises the amino acid sequence set forth in SEQ ID NO: 15 (Domain II), SEQ ID NO: 16 (Domain I+II), or SEQ ID NO: 17 (Domain II+III), or two or more of said amino acid sequences.

20. A non-human transgenic eukaryotic organism that expresses and secretes ng.HuAFP into a biological fluid.

21. The transgenic organism of claim 20, wherein said transgenic organism is a mammal.

22. The transgenic organism of claim 21, wherein said mammal is a goat, sheep, camel, cow, pig, rabbit, horse, or llama.

23. The transgenic organism of claim 21, wherein said biological fluid is milk, urine, blood, or lymph.

24. The transgenic organism of claim 21, wherein said ng.HuAFP is expressed from a transgene that comprises: (i) a nucleic acid sequence encoding ng.HuAFP, (ii) a promoter that is operably linked to said ng.HuAFP-encoding sequence and that enables expression of ng.HuAFP by cells of said transgenic organism that secrete protein into a biological fluid, and (iii) a leader sequence encoding a protein secretory signal that

enables secretion of said ng.HuAFP into said biological fluid by said cells of said transgenic organism.

25. The transgenic organism of claim 24, wherein said promoter is a milk-, urine-, blood-, or lymph-specific promoter and said leader sequence enables secretion of said ng.HuAFP into milk, urine, blood, or lymph, respectively.

26. The transgenic organism of claim 24, wherein said promoter is a milk-specific promoter and said leader sequence enables secretion of said ng.HuAFP into milk.

27. The transgenic organism of claim 26, wherein said transgenic organism is a goat.

28. The transgenic organism of claim 24, wherein said promoter is a urine-specific promoter and said leader sequence enables secretion of said ng.HuAFP into urine.

29. The transgenic organism of claim 28, wherein said mammal is a goat.

30. The transgenic organism of claim 24, wherein said promoter is a blood-specific promoter and said leader sequence enables secretion of said ng.HuAFP into blood.

31. The transgenic organism of claim 30, wherein said mammal is a goat.

32. The transgenic organism of claim 24, wherein said promoter is a lymph-specific promoter and said leader sequence enables secretion of said ng.HuAFP into lymph.

33. The transgenic organism of claim 32, wherein said mammal is a goat.

34. Non-human mammal's milk comprising ng.HuAFP.

35. The milk of claim 34, wherein said ng.HuAFP is soluble and is produced by a transgenic non-human mammal whose milk-producing cells express a transgene that comprises: (i) a nucleic acid sequence encoding ng.HuAFP, (ii) a milk-specific promoter that is operably linked to said ng.HuAFP-encoding sequence, and (iii) a leader sequence encoding a protein secretory signal that enables secretion of said ng.HuAFP by said milk-producing cells into milk of said mammal.

36. Non-human mammal's urine comprising ng.HuAFP.

37. The urine of claim 36, wherein the ng.HuAFP is soluble and is produced by a transgenic non-human mammal whose urine-producing cells express a transgene that

comprises: (i) a nucleic acid sequence encoding ng.HuAFP, (ii) a urine-specific promoter that is operably linked to said ng.HuAFP-encoding sequence, and (iii) a leader sequence encoding a protein secretory signal that enables secretion of said ng.HuAFP by said urine-producing cells into urine of said mammal.

38. Non-human mammal's blood comprising ng.HuAFP.

39. The blood of claim 38, wherein the ng.HuAFP is soluble and is produced by a transgenic non-human mammal whose blood-producing cells express a transgene that comprises: (i) a nucleic acid sequence encoding ng.HuAFP, (ii) a blood-specific promoter that is operably linked to said ng.HuAFP-encoding sequence, and (iii) a leader sequence encoding a protein secretory signal that enables secretion of said ng.HuAFP by said blood-producing cells into blood of said mammal.

40. Non-human mammal's lymph comprising ng.HuAFP.

41. The blood of claim 40, wherein the ng.HuAFP is soluble and is produced by a transgenic non-human mammal whose lymph-producing cells express a transgene that comprises: (i) a nucleic acid sequence encoding ng.HuAFP, (ii) a lymph-specific promoter that is operably linked to said ng.HuAFP-encoding sequence, and (iii) a leader sequence encoding a protein secretory signal that enables secretion of said ng.HuAFP by said lymph-producing cells into lymph of said mammal.

42. A method of producing ng.HuAFP, said method comprising the steps of:

(a) providing a cell transduced with a transgene that comprises: (i) a nucleic acid molecule encoding n.g.HuAFP comprising nucleotides 45 through 1874 of the nucleic acid sequence set forth in SEQ ID NO: 5, (ii) a promoter that is operably linked to said n.g.HuAFP-encoding molecule and that enables expression of said n.g.HuAFP by said cell, and (iii) a leader sequence encoding a protein secretory signal that enables secretion of said n.g.HuAFP by said cell; and

(b) growing said transduced cell, wherein said cell expresses and secretes said ng.HuAFP.

43. The method of claim 42, wherein said cell is an *E. coli*.

44. The method of claim 42, wherein said cell is a eukaryotic cell

45. The method of claim 44, wherein said eukaryotic cell is a yeast cell or an animal cell.

46. The method of claim 45, wherein said yeast cell is *Pichia pastoris*.

47. The method of claim 43, wherein said cell secretes said ng.HuAFP into cell culture medium.

48. The method of claim 45, wherein said animal cell is a milk-producing, urine-producing, blood-producing, or lymph-producing cell.

49. A method of producing ng.HuAFP, said method comprising the steps of:

(a) providing a transgenic organism comprising a transgene that comprises: (i) a nucleic acid molecule encoding ng.HuAFP comprising nucleotides 45 through 1874 of the nucleic acid sequence set forth in SEQ ID NO: 5, (ii) a promoter that is operably linked to said ng.HuAFP-encoding molecule and that enables expression of ng.HuAFP in a biological fluid-producing cell of said transgenic organism, and (iii) a leader sequence encoding a protein secretory signal that enables secretion of said rHuAFP by said biological fluid-producing cell; and

(b) collecting biological fluid that comprises said ng.HuAFP from said transgenic organism.

50. The method of claim 49, wherein said biological fluid is milk, urine, blood, or lymph.

51. The method of claim 50, wherein said biological fluid is milk.

52. The method of claim 51, wherein said ng.HuAFP is purified from said milk.

53. The method of claim 49, wherein said promoter is a milk-specific promoter that enables expression of ng.HuAFP in milk-producing cells of said transgenic organism.

54. The method of claim 50, wherein said biological fluid is urine.

55. The method of claim 54, wherein said ng.HuAFP is purified from said urine.

56. The method of claim 49, wherein said promoter is a urine-specific promoter that enables expression of ng.HuAFP in urine-producing cells of said transgenic organism.

57. The method of claim 50, wherein said biological fluid is blood.

58. The method of claim 57, wherein said ng.HuAFP is purified from said blood.

59. The method of claim 49, wherein said promoter is a blood-specific promoter that enables expression of ng.HuAFP in blood-producing cells of said transgenic organism.

60. The method of claim 50, wherein said biological fluid is lymph.

61. The method of claim 60, wherein said ng.HuAFP is purified from said lymph.

62. The method of claim 49, wherein said promoter is a lymph-specific promoter that enables expression of ng.HuAFP in lymph-producing cells of said transgenic organism.

63. A method of treating a patient in need of ng.HuAFP, said method comprising administering to said patient a therapeutically-effective amount of ng.HuAFP purified from a cell culture medium comprising said ng.HuAFP.

64. A method of treating a patient in need of ng.HuAFP, said method comprising administering to said patient a therapeutically-effective amount of a non-human mammal's milk comprising ng.HuAFP.

65. A method of treating a patient in need of ng.HuAFP, said method comprising administering to said patient a therapeutically-effective amount of ng.HuAFP purified from a non-human mammal's biological fluid comprising said ng.HuAFP.

66. The method of claim 65, wherein said biological fluid is milk, urine, blood, or lymph.

67. A therapeutic composition comprising ng.HuAFP comprising the amino acid sequence set forth in SEQ ID NO: 8.

68. Use of ng.HuAFP comprising the amino acid sequence set forth in SEQ ID NO: 8 in the manufacture of a medicament for the treatment of an immunologic disorder.

69. The use of claim 68, wherein said immunologic disorder is HIV.

70. Use of ng.HuAFP comprising the amino acid sequence set forth in SEQ ID NO: 8 in the manufacture of a medicament for the treatment of an autoimmune disorder.

71. The use of claim 70, wherein said autoimmune disorder is rheumatoid arthritis, muscular dystrophy, systemic lupus erythematosus, myasthenia gravis, multiple sclerosis, insulin-dependent diabetes myelitis, or psoriasis.

72. Use of ng.HuAFP comprising the amino acid sequence set forth in SEQ ID NO: 8 in the manufacture of an immunosuppressive agent.

73. The use of claim 72, wherein said immunosuppressive agent inhibits or treats autoreactive immune cell proliferation or graft-versus-host disease.

74. Use of ng.HuAFP comprising the amino acid sequence set forth in SEQ ID NO: 8 in the manufacture of a medicament for mitigating the side effects of chemotherapy or irradiation therapy.

75. Use of ng.HuAFP comprising the amino acid sequence set forth in SEQ ID NO: 8 in the manufacture of a medicament for enhancing cell proliferation.

76. The method of claim 44, wherein said cell secretes said ng.HuAFP into cell culture medium.